

*Reference 2*

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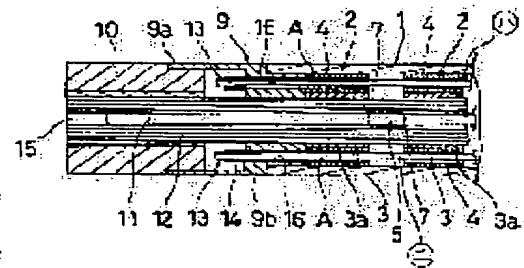
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## (54) FIBER SCOPE OSCILLATION STRUCTURE

### (57) Abstract:

**PURPOSE:** To provide a fiber scope oscillation structure which achieves a finer diameter while enabling oscillation of a fiber scope so much and moreover is excellent in strength.

**CONSTITUTION:** A plurality of slicing bodies 2 are arranged in rows along the length thereof at a specified interval. The slicing bodies 2 have a thin short metal cylinder body 3 and a plurality of thin fine-diameter metal cylinder 4 arranged in a chain over the entire outer circumferential surface 3a of the short cylinder 3. The short cylinder 3 and the fine-diameter cylinder 4 are put together by soldering or an adhesive so that the axis center of the short cylinder 3 parallels the axis center of the fine-diameter cylinder. A pair of spacer 5 for an oscillation fulcrum is interposed between adjacent slicing bodies 2 and 2. The spacer 5 is of a cylinder with a fine diameter having R chamfered parts 7 and 7 on the outer periphery of both end faces thereof.



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**CLAIMS**

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[Claim(s)]

[Claim 1] Cover the perimeter of a peripheral face of a metal light-gage short cylinder object, and two or more metal light-gage narrow diameter barrels are installed side by side in the shape of a rosary. Infix a spacer for oscillation fulcrums of a couple of a narrow diameter cylindrical shape which has two or more round slice objects unified so that an axial center of this short cylinder object and an axial center of this narrow diameter barrel might become parallel, and has an R-like chamfering portion on the periphery edge of a both-ends side between these round slice objects that carry out at least adjacency, and. Fiberscope oscillation structure having inserted coordinated striatum in four narrow diameter barrels allocated in 90 degrees of hoop direction pitch among narrow diameter barrels of the above-mentioned round slice object, and installing successively two or more above-mentioned round slice objects to a longitudinal direction with a prescribed interval.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

[Industrial Application]This invention relates to fiberscope oscillation structure.

**[0002]**

[Description of the Prior Art]What shows drawing 13 and drawing 14 the conventional oscillation structure is known. That is, it has two or more short cylinder object a— and sphere b— infixd among these short cylinder objects a and a, and the breakthroughs e and e of each short cylinder object a— by which the wire d for oscillation is inserted in peripheral wall c—, respectively enabling a free slide are installed. These breakthroughs e and e are allocated in the position of symmetry about the center of the short cylinder object a.

[0003]The hollows f and f were established in the position which shifted to the breakthroughs e and e and a hoop direction 90 degrees in the both-ends side of the peripheral wall c of the short cylinder object a, and the sphere b has fitted into the hollows f and f of the short cylinder objects a and a which carry out at least adjacency. The drilled hole n which carries out free passage connection of the hollows f and f is formed, the coordinated striatum of a graphic display abbreviation is inserted in the drilled hole m of the sphere b, and the drilled hole n of the short cylinder object a, and each short cylinder object a is connected with the short cylinder object a.

[0004]And as shown in drawing 14, adhered the connecting tools i and j to the image guide p (refer to drawing 16) etc. with the fulcrums g and h, and the tip of the wires d and d for oscillation was adhered to the latest connecting tool i, and these wires d and d were inserted in the stoma of the connecting tool j of another side, enabling free sliding, and the outer tube k was covered.

[0005]Therefore, rocking of the short cylinder objects a and a which carry out at least adjacency is mutually enabled via the sphere b, and if one wire d for oscillation is pulled to the end face side, as shown in drawing 14, they can shake a head to this one wire d side. Of course, if the wire d for oscillation of another side is pulled to the end face side, a head will be shaken to the case where it is shown in drawing 14, and an opposite direction.

**[0006]**

[Problem(s) to be Solved by the Invention]In the above-mentioned conventional oscillation structure, when it was going to make the whole outside diameter size into the byway, outside diameter size  $D_0$  (refer to drawing 15) of the sphere b needed to be made small.

[0007]However, planar pressure became excessive, when outside diameter size  $D_0$  of the sphere b was set up small, moreover, the thickness dimension T was small, it will be inferior in intensity and there was a limit in setting out of outside diameter size  $D_0$ .

[0008]Therefore, also when the short cylinder object a was made into a byway, each sphere b could not be set up not much small, but as shown in drawing 16, there was a fault which protrudes the sphere b from the peripheral wall c of the short cylinder object a and from which the image guide p by which an inner package is carried out, the light guide q, etc. serve as a byway.

[0009]When making the sphere b into the byway, there was also a fault which the size between the short cylinder objects a and a becomes small, and an oscillation possible angle becomes small, and becomes a high cost that it is moreover hard to manufacture.

[0010]So, in this invention, in spite of being able to make an outside diameter size into a byway, an oscillation possible angle does not become small, but it aims at providing the fiberscope oscillation structure where it excelled also in intensity moreover.

[0011]

[Means for Solving the Problem]In order to attain the above-mentioned purpose, fiberscope oscillation structure concerning this invention, Cover the perimeter of a peripheral face of a metal light-gage short cylinder object, and two or more metal light-gage narrow diameter barrels are installed side by side in the shape of a rosary, Infix a spacer for oscillation fulcrums of a couple of a narrow diameter cylindrical shape which has two or more round slice objects unified so that an axial center of this short cylinder object and an axial center of this narrow diameter barrel might become parallel, and has an R-like chamfering portion on the periphery edge of a both-ends side between these round slice objects that carry out at least adjacency, and. Coordinated striatum is inserted in four narrow diameter barrels allocated in 90 degrees of hoop direction pitch among narrow diameter barrels of the above-mentioned round slice object, and two or more above-mentioned round slice objects are installed successively to a longitudinal direction with a prescribed interval.

[0012]

[Function]Between the round slice objects which carry out at least adjacency, since the spacer for oscillation fulcrums of the couple is infix, the round slice object can rock a spacer as a fulcrum mutually, and if it uses coordinated striatum as the wire for oscillation and pulls this striatum to the end face side by this, it will shake a head.

[0013]The round slice object does not need to form the hollow into which install the breakthrough for the wire for oscillation through, or a sphere is made to fit like before in two or more metal light-gage narrow diameter barrels installed side by side over the perimeter of the peripheral face of a metal light-gage short cylinder object and this short cylinder object, and a round slice [ \*\* and others ] object.

[0014]A spacer is a narrow diameter cylindrical shape.

The whole outside diameter size can be made small and, moreover, it is not inferior in intensity.

[0015]

[Example]Hereafter, based on the drawing in which an example is shown, this invention is explained in full detail.

[0016]Drawing 1 shows the fiberscope oscillation structure concerning this invention, and this structure is provided with two or more round slice object 2 -- by which an inner package is carried out to the outer tube 1, and coordinated striatum A-- which connects each round slice object 2 --, for example, it is inserted in the inside of piping, a various device, etc. as industrial use, and observation etc. are performed.

[0017]The deer was carried out, and the round slice object 2 is provided with metal light-gage narrow diameter barrel 4 -- installed side by side in the shape of a rosary as shown in drawing 2 over the perimeter of the peripheral face 3a of the metal light-gage short cylinder object 3 and this short cylinder object 3.

[0018]That is, although the short cylinder object 3 consists of stainless steel, steel, etc. and it is supposed, for example that the thickness dimension t (refer to drawing 2) is it as about 0.05-0.1 mm, it is also possible to be referred to as 30-100mu.

[0019]As narrow diameter barrel 4 -- is shown in drawing 2, it has barrel 4a-- for four cooperation striatum allocated by 90 degrees of hoop direction pitch, and barrel 4b-- for infixation infix between the barrels 4a for coordinated striatum, and let the barrels 4a and 4b be the same or a diameter of the approximately same. furthermore -- the linear dimension (axial center direction length) of each narrow diameter barrel 4, and the linear dimension (axial center direction length) of the short cylinder object 3 -- abbreviated -- it is set up identically.

[0020]And fixing integration of the short cylinder object 3 and narrow diameter barrel 4 -- is

carried out with soldering or adhesives. In drawing 2, S is an enveloping layer which consists of a soldering layer or an adhesives layer.

[0021]In this case, the narrow diameter barrels 4 and 4 which carry out at least adjacency are mutually made into adhesion state, and the axial center of the short cylinder object 3 and the axial center of each narrow diameter barrel 4 are allocated in parallel.

[0022]Suppose that it is as about 1.5 mm as the outside diameter size D of the round slice object 2.

[0023]A deer is carried out, and between the round slice objects 2 and 2 which carry out at least adjacency, as shown in drawing 4, spacer 5 -- for oscillation fulcrums of the couple is infix.

[0024]As the spacer 5 is shown in drawing 3, it is a narrow diameter cylindrical shape and the R-like chamfering portions 7 and 7 are formed in the periphery edge of the both-ends sides 6 and 6.

[0025]And the two striatum A and A of four striatum A-- inserted in the four barrels 4a for coordinated striatum in this case (for example, striatum of I and RO) allocated in the position of symmetry about the center of the short cylinder object 3 as shown in drawing 5 among them is inserted in the breakthrough 8 (refer to drawing 3) of the spacer 5.

[0026]Therefore, the spacers 5 and 5 allocated between the round slice objects 2 and 2 which carry out at least adjacency are allocated in the position of symmetry about the center of the short cylinder object 3.

[0027]Like the short cylinder object 3 and the narrow diameter barrel 4, the spacer 5 consists of stainless steel, steel, etc., and when equipped with the outside diameter size D<sub>1</sub> (refer to drawing 3), it makes it the grade which is not protruded into the exterior from the enveloping layer S, or is not protruded into the inside of the short cylinder object 3.

[0028]Namely, as two or more round slice object 2 -- is connected and is moreover shown in drawing 6 via cooperation striatum [ of four ] A-- allocated in 90 degrees of hoop direction pitch, The end faces 6 and 6 of each spacer 5 contact the end faces 2a and 2a of the round slice object 3, and two or more round slice objects 2 are installed successively by the longitudinal direction with a prescribed interval (getting it blocked linear dimension [ of the spacer 5 ] L).

[0029]As a deer is carried out and it is shown in drawing 1, the striatum supporter 9 which has axial center direction breakthrough 16 -- is attached at the tip of the outer tube 1, and the tip end cylinder part material 10 is formed successively by this supporter 9. The image guide 11 and the light guide 12 of each round slice object 2 -- which are inserted in short cylinder object 3 -- are inserted in this supporter 9, and insertion immobilization of the tip part of the image guide 11 and the light guide 12 is carried out further at the tip end cylinder part material 10.

[0030]It consists of the tip end cylinder part 9a and the end face cylinder part 9b, the striatum A is inserted in the breakthrough 16 formed in the end face cylinder part 9b, the slip off stop member 14 is attached outside via the breakthrough 16 by the striatum tip part 13 which rushed into the tip end cylinder part 9a, and the supporter 9 stops the striatum tip part 13 to the supporter 9. 15 is an object lens which consists of a rod lens attached at the tip of the image guide 11.

[0031]And the fulcrum members of the graphic display abbreviation used as the fulcrum for the first time in a head are formed successively at the end face side of the round slice object 2 of the maximum end face. That is, the image guide 11 adheres to this fulcrum member, and the striatum A is inserted in it, enabling free sliding.

[0032]Therefore, the striatum A and A (it is got blocked and is the striatum of Ha and NI) in which the spacer 5 is not inserted will have a function as a wire for oscillation.

[0033]That is, if the striatum A of NI is pulled in the direction of arrow B shown in drawing 6 from the state where each round slice object 2 -- was allocated by linear shape as shown in drawing 4, the supporter 9 will be pulled to the end face side, but. In this case, since movement by the side of a end face is regulated in the fulcrum member of a graphic display abbreviation and the spacer 5 is not inserted in the striatum A and A of Ha and NI, the round slice object 2 of the maximum end face each round slice object 2 --, Rocking by the side of the striatum A of NI is possible, and moreover, since the R-like chamfering portions 7 and 7 are formed in the

periphery edge of the both-ends sides 6 and 6 of the spacer 5, the rocking can be performed smoothly.

[0034]Therefore, if the striatum A of NI is pulled to the end face side like the arrow B, this fiberscope will shake a head in the direction of arrow C, as shown in drawing 5 and drawing 6.

[0035]If Ha's striatum A is pulled in the direction of arrow E shown in drawing 6 from the state shown in drawing 4, as an imaginary line shows, a head will be shaken in the direction of arrow F.

[0036]Therefore, according to this structure, as shown in drawing 2, for the first time in [ of the 2-way of the 180 \*\* contrary / a head ] is possible.

[0037]Next, drawing 7 makes possible for the first time in [ which shifted to the hoop direction 90 degrees / of the four directions of J, M, H, and P / a head ], as other examples are shown and it is shown in drawing 8 and drawing 9 in this case.

[0038]That is, the spacer 5 of a couple infixes between the round slice objects 2 and 2 which carry out at least adjacency in this case is allocated so that it may become the position of symmetry about the center of the short cylinder object 3, and each 90 degrees spacer 5 -- can be shifted to the hoop direction by turns along with the longitudinal direction.

[0039]Therefore, all four striatum A-- accomplishes the function as a wire for oscillation.

[0040]Namely, if the striatum A of NI is pulled in the direction of arrow G shown in drawing 10 from the linear position shown in drawing 7, Although the round slice objects 2 and 2 which have sandwiched with Ha the spacers 5 and 5 in which the striatum A and A of NI is inserted are not rocked mutually, the round slice objects 2 and 2 which have sandwiched the spacers 5 and 5 in which the striatum A and A of I and RO is inserted are rockable, and shake a head as a whole in the direction of arrow H shown in drawing 8 and drawing 10.

[0041]If Ha's striatum A is pulled in the direction of arrow I shown in drawing 10 from the linear position shown in drawing 7, as shown in drawing 8 and drawing 10, a head will be shaken in the direction of arrow J.

[0042]If a head is shaken in the direction of arrow M as it is shown in drawing 9, if the striatum A of I is pulled in the direction of K from a linear position, and the striatum A of RO is pulled in the direction of arrow N from a linear position, as shown in drawing 9, a head will be shaken in the direction of arrow P.

[0043]\*\* inserts only the image guide 11 in the short cylinder object 3, and divides the light guide 12 and it is made to make insert in narrow diameter barrel 4b-- in an above-mentioned example as shown in drawing 11 although the image guide 11 and the light guide 12 were inserted in the short cylinder object 3 -- it is free.

[0044]Therefore, according to the oscillation structure shown in this drawing 11, it is the narrow diameter barrel 4b. -- Effective use was aimed at and it has contributed to narrow diameter-ization of this oscillation structure.

[0045]By the way, when manufacturing the round slice object 2, as shown in drawing 12, the pipe material 20 for short cylinder object formation and the pipe material 21 for narrow diameter barrel formation are formed by drawing-out processing etc., Covering the peripheral face of the pipe material 20 for short cylinder object formation, the side-by-side installation unification of the pipe material 21 for narrow diameter barrel formation is carried out with adhesives or soldering, the raw material 22 is formed in the perimeter, cut processing of this raw material 22 can be carried out to predetermined length, and it can be manufactured.

[0046]In the range which this invention is not limited to an above-mentioned example, and does not deviate from the gist of this invention, are design variation freedom, for example, as the metal light-gage narrow diameter barrel 4, Since this barrel 4a-- is allocated by 90 degrees of hoop direction pitch, including the four barrels 4a for coordinated striatum, it is not necessary to restrict to 16 pieces like an example also as the number of these whole narrow diameter barrels 4. Although it is preferred to consider it as multiples of 4, such as 12 etc. pieces, in addition to 16 pieces, it is not necessary to consider it as the multiple of 4, and not necessarily Namely, the barrel 4a for coordinated striatum, \*\* which allocates the four barrels 4a for coordinated striatum in 90 degrees of hoop direction pitch without making different the diameter dimension of barrels 4b for infixation other than this, and considering it as the multiple of 4 -- it is free.

[0047]Although the number of the round slice objects 2 can be set up freely and the linear

dimension (axial center direction size) of the round slice object 2, the linear dimension of the spacer 5, etc. can be changed freely. Since the gap size of the round slice objects 2 and 2 which carry out at least adjacency will become small and the rockable range will become narrow if the linear dimension of the spacer 5 is set up not much short, as linear dimension [ of the spacer 5 ] L, being referred to as 1.0 mm is preferred.

[0048]Although it can change freely also as outside diameter size  $D_1$  of the spacer 5, it is set up in consideration of the thickness dimension t of outside diameter size  $D_2$  of the outside diameter size D of the whole round slice object 2, and the short cylinder object 3, outside diameter size  $D_3$  of the narrow diameter barrel 4, and the short cylinder object 3, the outside diameter size of the striatum A, etc. Namely, for example, suppose that it is at least as 2.4 mm phi about the outside diameter size D of the round slice object 2, and it is supposed that it is at least as 0.4 mm phi about outside diameter size  $D_3$  of the narrow diameter barrel 4. It is preferred to suppose that it is at least as 1.6 mm phi about outside diameter size  $D_2$  of the short cylinder object 3, to suppose that it is as about 0.05 mm about the thickness dimension t of the short cylinder object 3, to suppose that it is at least as 0.2 mm phi about the outside diameter size of the striatum A, and to suppose that it is at least as 0.4 mm phi about outside diameter size  $D_1$  of the spacer 5.

[0049]Although it can change freely also as a curvature radius of the R-like chamfering portion 7 of the spacer 5, it is preferred to set it as 0.1mm R for example.

[0050]

[Effect of the Invention]Since this invention is constituted like \*\*\*\*\*, the effect indicated below is done so.

[0051]Since it is necessary to form neither the breakthrough for the wire for oscillation, nor the hollow for making a sphere fit in when forming the round slice object 2, the thing of a byway can be easily formed in low cost. As shown in drawing 12, namely, the pipe material 20 (manufactured by drawing-out processing etc.) for short cylinder object formation, What is necessary is to form the raw material 22 of the predetermined length which consists of pipe material 21 — for narrow diameter barrel formation (manufactured by drawing-out processing etc.) installed by the periphery of this pipe material 20 side by side, and just to cut this raw material 22 to a prescribed dimension. If it forms in this way, there is an advantage which can acquire the round slice object 2 of desired size easily.

[0052]And since the conventional thing is different and a cylindrical shape, the spacer 5, What is necessary is just to carry out chamfering-of-the-edge processing of the both ends of the narrow diameter pipe of uniform length, and the thing of a byway can be manufactured easily, and when manufacturing this spacer 5, by making the spacer 5 into a byway, this whole oscillation structure can be made into a byway, and even if it is a byway, moreover, it becomes the thing outstanding in intensity.

[0053]In spite of being a byway, the gap size between the round slice objects 2 and 2 which carry out at least adjacency cannot become small, and the rocking range of each round slice object 2 cannot become short, but the range of desired can be made to shake a head greatly.

[0054]Since the R-like chamfering portions 7 and 7 are formed in the periphery edge of the both-ends sides 6 and 6, the spacer 5 can rock the round slice object 2 smoothly, and can make head for the first time in operation perform smoothly.

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[Translation done.]

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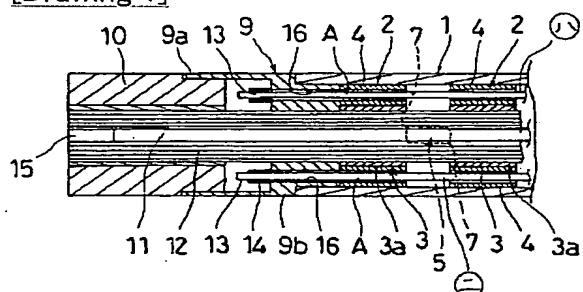
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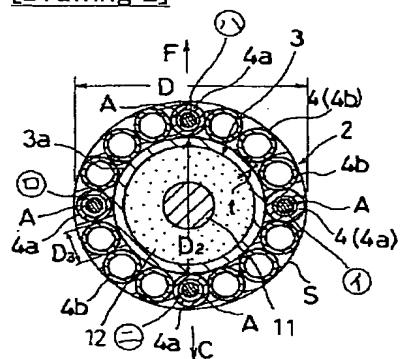
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DRAWINGS

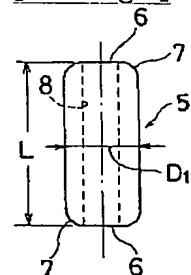
[Drawing 1]



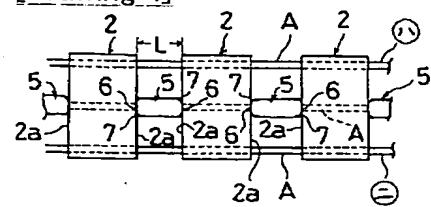
[Drawing 2]

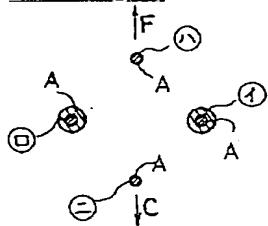
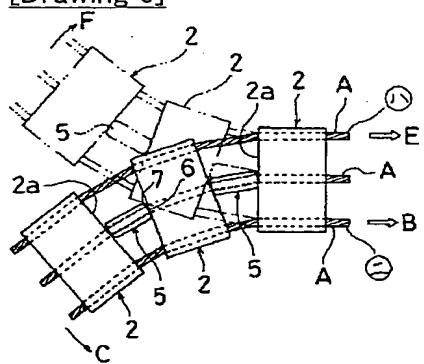
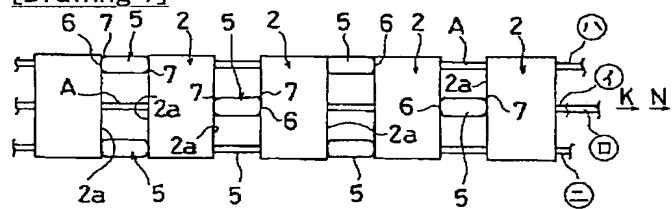
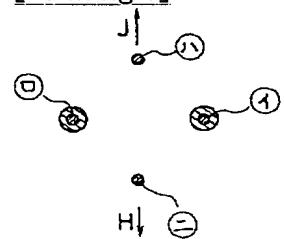
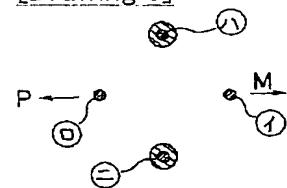
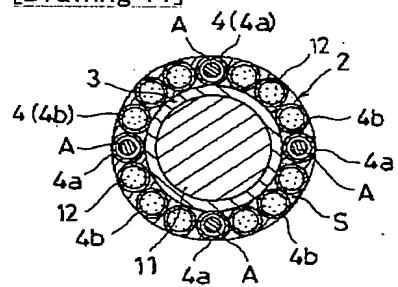


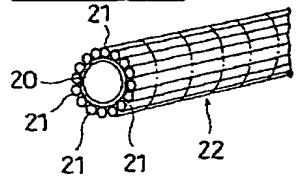
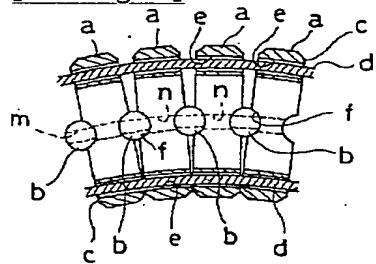
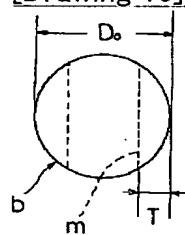
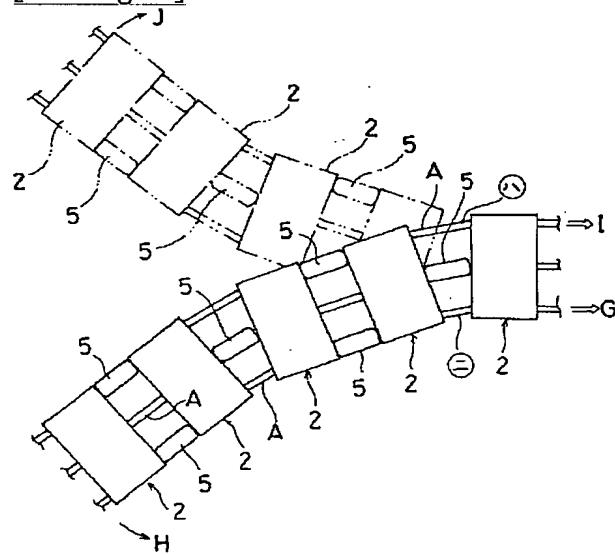
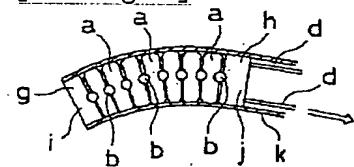
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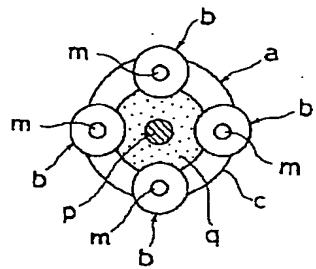


[Drawing 4]



[Drawing 5][Drawing 6][Drawing 7][Drawing 8][Drawing 9][Drawing 11]

[Drawing 12][Drawing 13][Drawing 15][Drawing 10][Drawing 14][Drawing 16]



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